

Indiana State of the Environment Report

Air Quality



Photo by Richard Fields, Indiana Department of Natural Resources.

Hoosiers want clean, healthy air. Whether commuting to work, enjoying a horse ride on an Owen County farm or standing atop Mt. Baldy in the Indiana Dunes, clean air is important to the quality of our life and the enjoyment of Indiana's natural resources.

Air quality

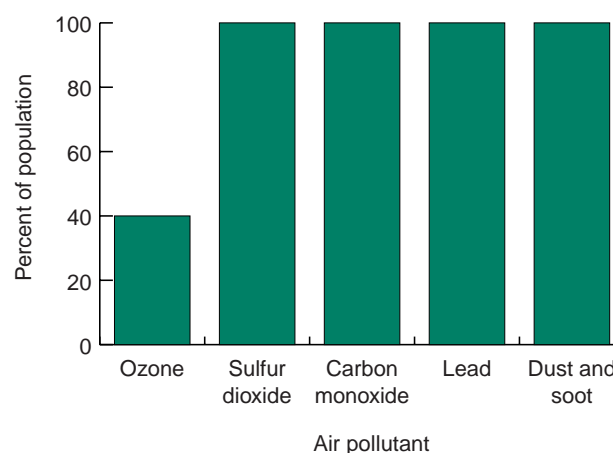
Air pollution

Indiana's air has become significantly cleaner in the last 10 years. Stricter standards and better compliance by industry have reduced smog and dust levels and improved visibility. Indiana's air meets health standards set by the U.S.

Environmental Protection Agency (EPA) for sulfur dioxide, carbon monoxide, lead, dust and soot across the state. However, in some parts of the state, ozone levels still exceed federal standards. Levels of toxic chemicals, for which there are no federal standards, also are of concern in Indiana.

Air pollution has numerous health effects. Children, the elderly and people with lung diseases are especially susceptible to health complications from air pollution. Pollutants in the air we breathe can cause a scratchy throat, coughing, difficulty breathing, watery eyes, inflamed lung tissue, aggravated asthma, lung disease, cancer, reduced immune defenses and other problems. Air pollution comes from motor vehicles, industry and many other everyday activities.

Percent of Indiana's population breathing healthy air
By pollutant



Source: IDEM Office of Air Management, air monitoring data, 1999

for more details
visit air @

www.state.in.us/idem/soer99report/air

Ozone

Ozone in the upper atmosphere is the “good” ozone that protects us from the sun’s radiation. Ground-level ozone, which is formed when volatile organic compounds (VOCs), nitrogen oxides (NO_x) and sunlight mix, is the “bad” ozone that irritates the lungs and causes significant health problems for many people. Ozone is an air quality problem in the summer months when temperature and sunlight are the greatest.

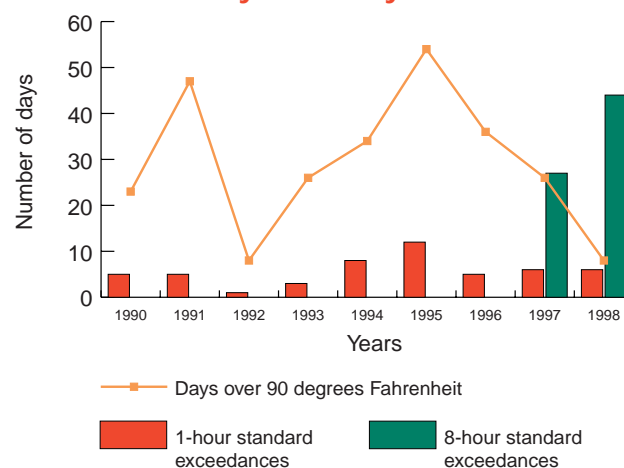
Ozone can lead to reduced lung function, increased respiratory inflammation, coughing, chest pain and nausea. Children are especially at risk from ground-level ozone because they breathe more air for their body weight than adults and spend more time outdoors in the summer.

Until 1997, the nation’s ozone standard was 125 parts per billion, measured over one hour. When a monitor in an area exceeded the standard more than once a year, the area did not attain the standard. In July 1997, EPA established a more stringent ozone standard based on health studies addressing longer term exposure. This standard requires concentrations of less than 85 parts per billion, measured over eight hours, and more closely reflects exposure to people who work and play outside in the summer. The one-hour standard remains in effect only for those counties that have not met this standard: Clark, Floyd, Lake and Porter.

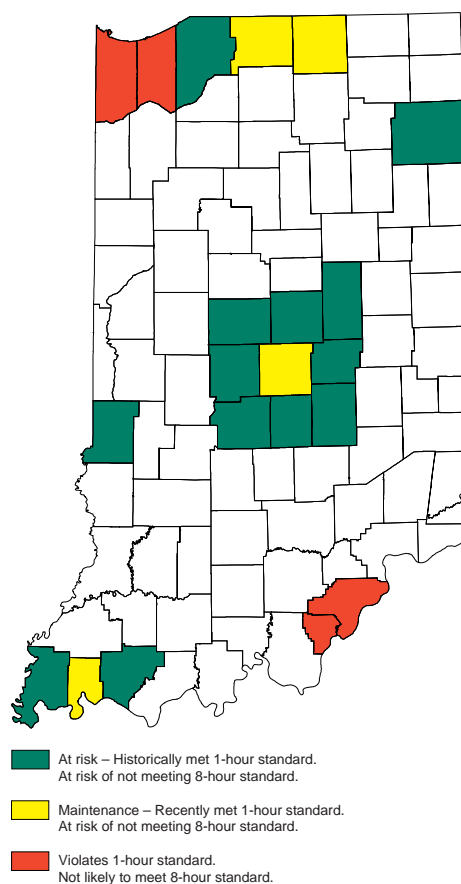
Percent of Indiana’s population in areas not meeting the ozone health standards

- 13 percent of Indiana’s population lives in areas that do not meet the one-hour standard for ozone.
- 60 percent of Indiana’s population lives in areas that likely will not meet the new eight-hour standard for ozone.

Indiana unhealthy ozone days



Areas not likely to meet the ozone standard



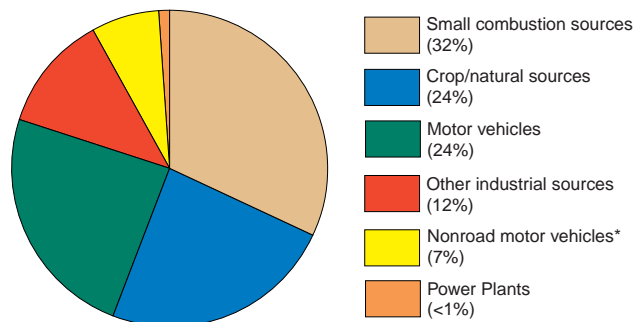
Source: IDEM Office of Air Management, 1998

Ozone sources

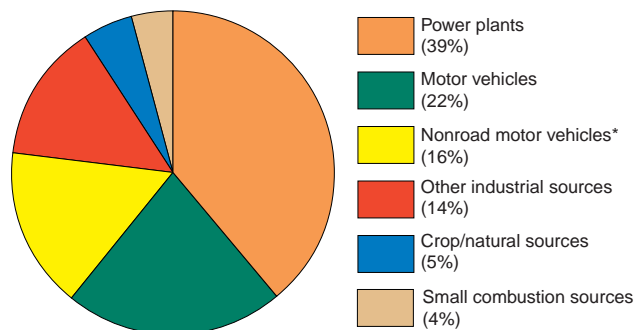
Ozone levels are typically higher in urban areas that are densely populated. Motor vehicles, manufacturing and other industrial activities emit nitrogen oxides and volatile organic compounds that react in sunlight to form ozone. Pollutants that cause ozone include gasoline vapors, chemical solvents and combustible fuels. Additionally, emissions of nitrogen oxides from smoke stacks can travel downwind and increase ozone levels in surrounding urban and rural areas.

Major contributors to ozone

Sources of volatile organic compounds in Indiana



Sources of nitrogen oxides in Indiana



* Nonroad motor vehicles – agriculture, lawn, recreational and construction equipment

Source: IDEM Office of Air Management, 1998.

Regional nature of ozone

Ozone is generated locally and is transported from upwind sources. Ozone and the pollutants that form ozone can be carried significant distances downwind from their points of origin.

Ozone is generated primarily within urban areas and is transported across county, state and national boundaries. Indiana's cars, factories and other human activities generate ozone that is transported within Indiana and to other states. In turn, the ozone generated by our neighboring states is carried across our borders and affects the quality of air Indiana's citizens breathe. Consequently, the areas in Indiana that do not meet health standards for ozone cannot fully solve their own ozone problems by themselves.

In mid-August, a high pressure system over mid and southern Indiana provided several consecutive sunny days with near-90° temperatures, ideal weather conditions for the formation of ground-level ozone. The adjacent maps show one-hour and eight-hour ozone concentration levels in Indiana for August 22, 1998. The ozone levels are based on monitoring data put into a model that shows regional ozone patterns. The maps also demonstrate how ozone spreads and is not necessarily concentrated in urban areas.

Ozone peak values on August 22, 1998

1-hour average concentration



8-hour average concentration



Source: U.S. Environmental Protection Agency, 1998

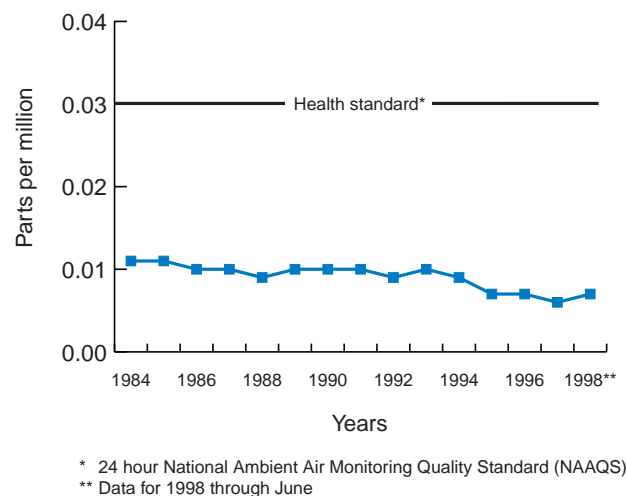
Sulfur dioxide

Sulfur dioxide can cause breathing impairment of asthmatic children and adults, as well as aggravating existing respiratory illnesses and cardiovascular disease. Populations particularly sensitive to sulfur dioxide include children, older adults, asthmatics and people with chronic lung disease. Also, sulfur dioxide is a primary component of acid rain, which is discussed on page 12.

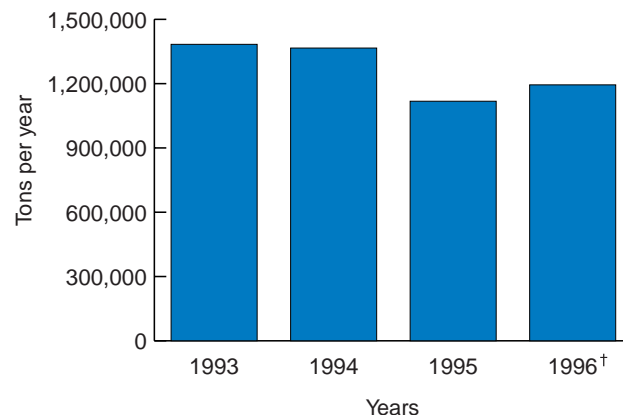
Sulfur dioxide air quality in Indiana has improved dramatically. All areas of Indiana currently meet federal health standards for sulfur dioxide. Indiana's annual sulfur dioxide emissions from coal-fired power plants have fallen from more than 1.5 million tons in 1980 to approximately 0.5 million tons in 1996. Many Indiana power plants have greatly reduced sulfur dioxide emissions by investing in air pollution control equipment such as scrubbers, using low-sulfur coal and maximizing use of lower polluting boilers.

Levels of sulfur dioxide have decreased since the mid-1980s in Evansville, where annual averages remain well below the health standard.

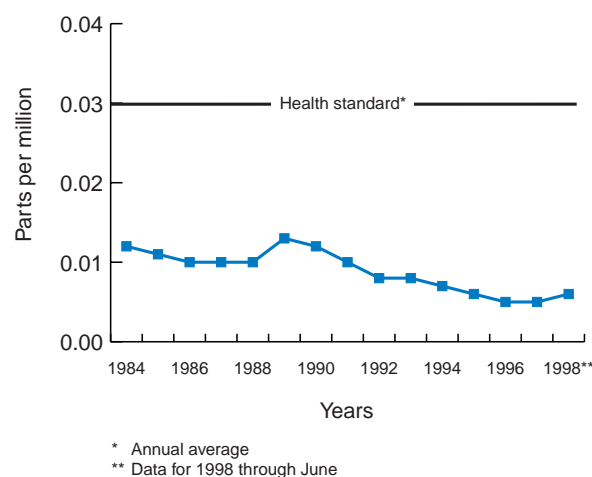
Sulfur dioxide air quality Statewide composite average



Indiana sulfur dioxide emissions



Sulfur dioxide air quality Evansville composite average



[†] Since the 1998 State of the Environment Report, adjustments have been made to the 1996 sulfur dioxide emissions data to reflect updated information from EPA.

Source: IDEM Office of Air Management, 1998

Carbon monoxide

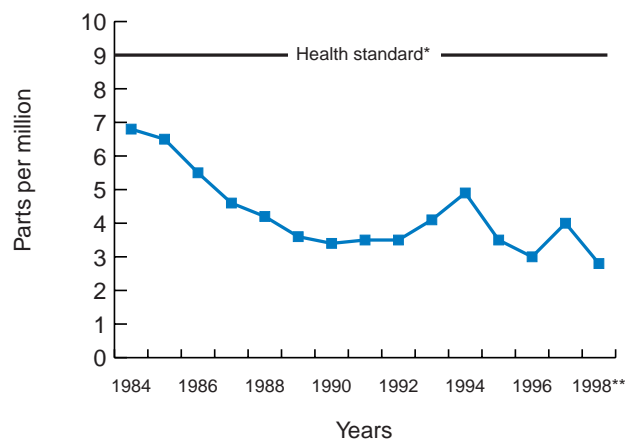
Carbon monoxide in the bloodstream reduces the flow of oxygen to tissues and organs, reducing vision and coordination and causing dizziness and reduced learning ability. Carbon monoxide is formed from incomplete combustion. Sources of carbon monoxide include vehicles, industrial processes and fuel combustion in boilers and incinerators.

All areas of Indiana currently meet federal health standards for carbon monoxide. Carbon monoxide levels continue to improve primarily due to stricter emission standards for new cars and improved combustion techniques and emission controls.

Levels of carbon monoxide have generally declined since the mid 1980s, with a slight increase since 1996.

In areas such as East Chicago, where levels of carbon monoxide were below the eight-hour standard but often above the Indiana composite average, carbon monoxide levels have decreased overall since the mid 1980s.

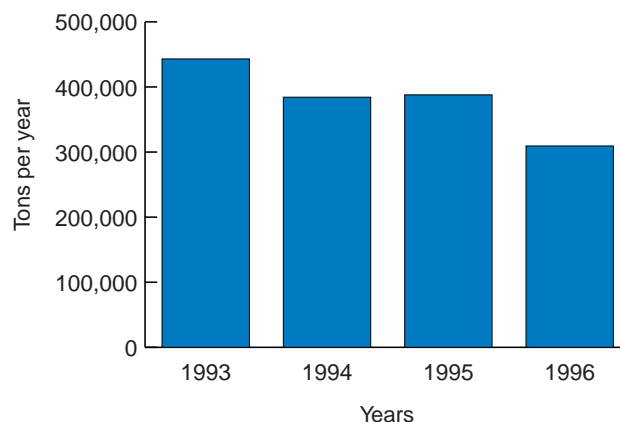
Carbon monoxide air quality Statewide composite average



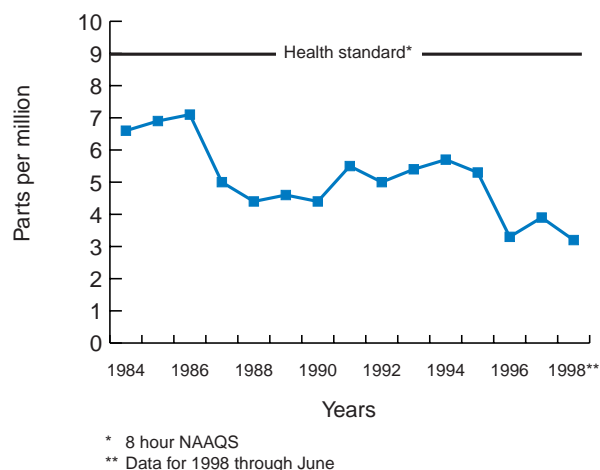
* 8 hour NAAQS

** Data for 1998 through June

Indiana carbon monoxide emissions



Carbon monoxide air quality East Chicago composite average



* 8 hour NAAQS

** Data for 1998 through June

Source: IDEM Office of Air Management, 1998

Lead

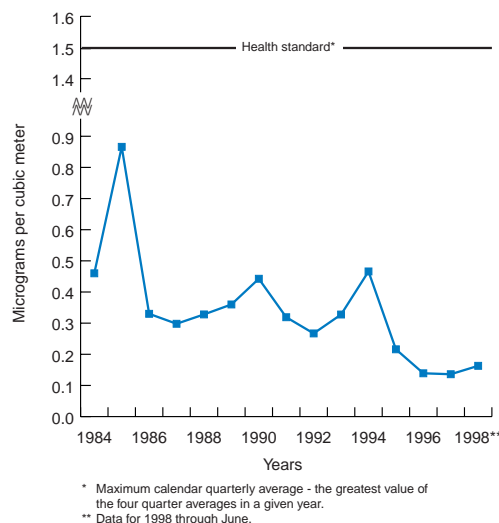
Excessive exposure to lead can result in lead poisoning and elevated blood lead levels, which may damage mental and physical attributes in children. While in the past the major source of lead was motor vehicles, the prohibition of leaded gasoline has significantly lowered lead levels. The remaining sources are facilities that process or produce materials that contain lead.

Aggressive state rules that limit emissions from these facilities and the closing of an Indianapolis facility have helped assure that no areas of Indiana have unhealthy lead levels in the air.

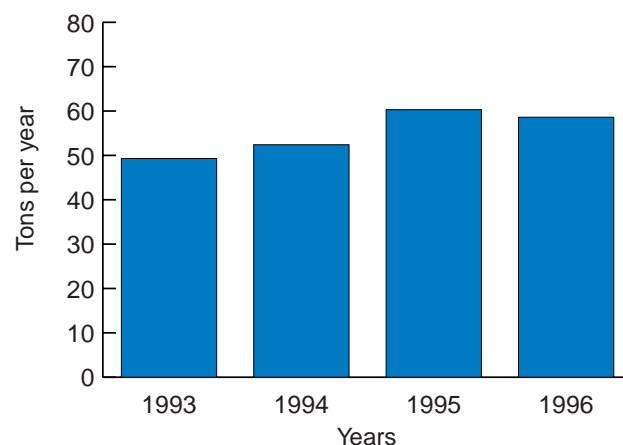
Levels of lead in Indiana's air have fallen dramatically since the mid 1980s, especially in Indianapolis. However, since 1995, there has been a slight increase in lead levels statewide.

For more information about lead in Indiana's environment, see Chemicals in the Environment, page 48.

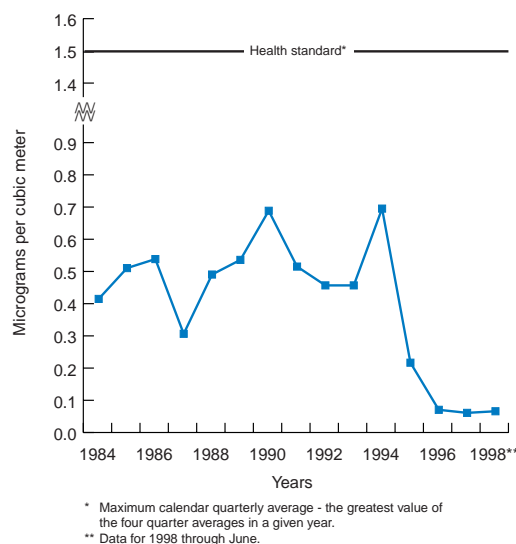
Lead air quality Statewide composite average



Indiana lead emissions



Lead air quality Indianapolis composite average



Source: IDEM Office of Air Management, 1998

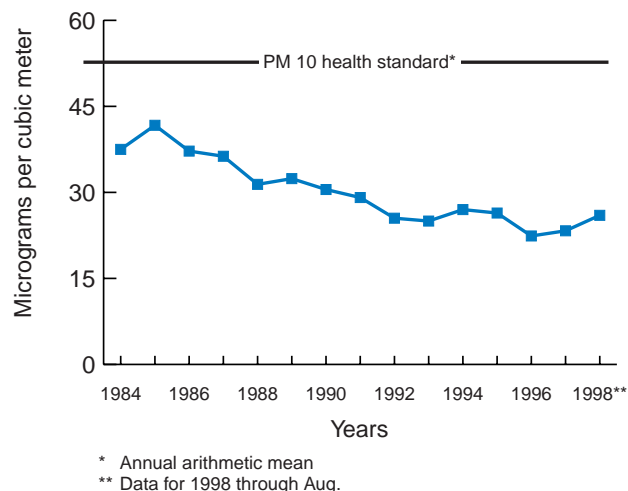
Dust and soot

Particulates are small pieces of aerosol mists, dust, dirt and soot emitted by sources such as cars, trucks, construction projects, factories, unpaved roads, fireplaces and wood stoves. Older adults, children and people with chronic lung disease are especially sensitive to particulates.

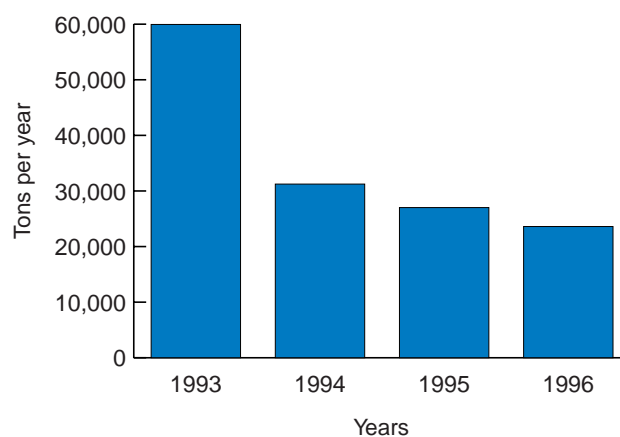
Recent studies indicate that the smallest particulates pose the most serious health threat because they can be inhaled more deeply into the lungs and are more difficult to exhale. In 1997, EPA established a new standard for particulates less than 2.5 micrometers (PM 2.5), or 25 times narrower than a strand of human hair. Like other states, Indiana is just beginning to establish sites that will monitor for PM 2.5. IDEM will place monitors at 40 locations statewide by the end of 1999 to evaluate the new standard. Once three years of data have been collected from these monitors, IDEM and EPA will determine whether any areas in Indiana exceed the new health standard for small particulates. During this time period, EPA will continue to review the PM 2.5 standard.

While there is little information on PM 2.5 levels, data have been collected on larger particles, PM 10, for a number of years. Levels of PM 10 in Indiana's air have fallen dramatically since the mid 1980s, especially in areas such as Gary where health standards had been exceeded.

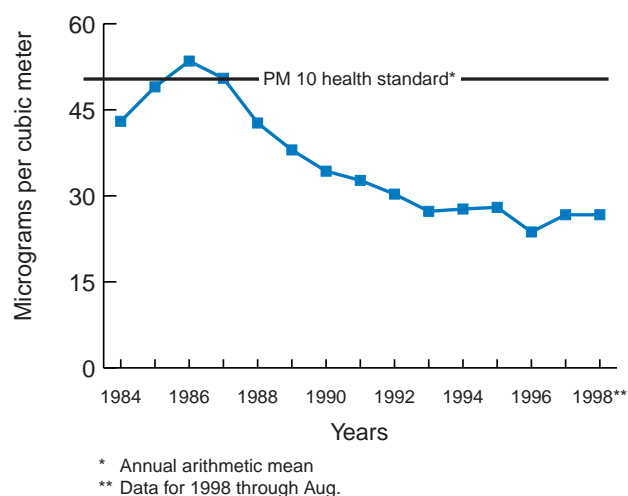
Particulate matter air quality Statewide composite average



Indiana dust and soot emissions



Particulate matter air quality Gary composite average



Source: IDEM Office of Air Management, 1998

Global climate change

Greenhouse gases in the atmosphere, such as carbon dioxide, methane and chlorofluorocarbons, trap the earth's heat and are thought by many scientists to be the cause of rising global temperatures. Global warming could change rain and temperature patterns and may affect Indiana's agriculture and quality of life.

Carbon dioxide, the primary greenhouse gas, occurs naturally, is exhaled by humans and animals, and is created by the combustion of fossil fuels. The global concentration of carbon dioxide has increased significantly in the modern industrial age. Energy conservation and the use of nonfossil fuels are ways to decrease the production of carbon dioxide.

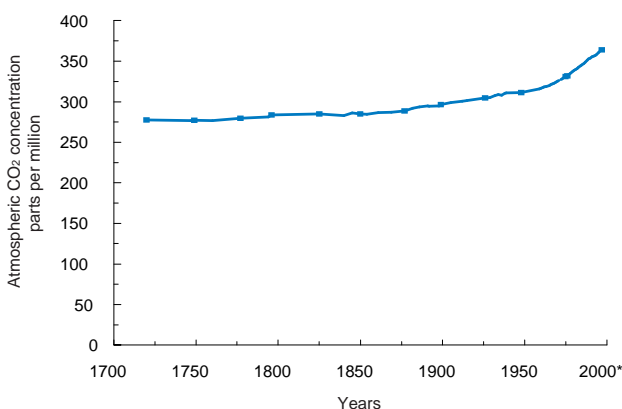
In 1990, Indiana sources emitted about 230 million tons of carbon dioxide, nearly 4 percent of the nation's total. Indiana ranks ninth among the states in carbon dioxide emissions.

Acid rain

Acid rain results from reactions involving sulfur dioxide, nitrous oxides and rainfall. While natural sources such as decaying plant life and volcanic eruptions contribute to acid rain, human sources, including the burning of fossil fuels and motor vehicle emissions, cause most acid rain.

Acid rain harms our aquatic life, causes the decay and corrosion of cars, paints, buildings and statues and damages forests and crops by affecting soil nutrients and killing essential bacteria. Acid rain does not cause significant problems for much of Indiana because soils and waterways are limestone-based and act as a natural buffer to acidic rainfall. Also, sulfur dioxide and nitrogen oxide emissions have been greatly reduced in recent years.

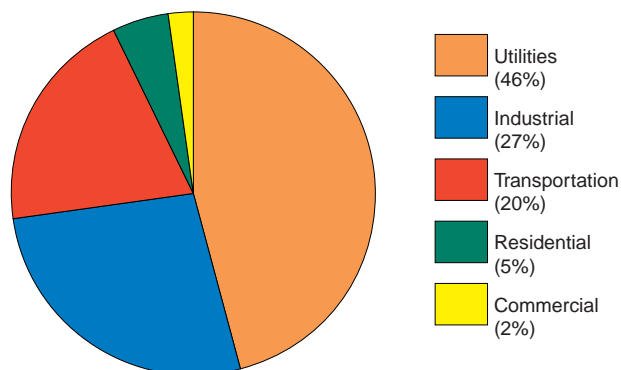
National carbon dioxide concentration trends



* Projected

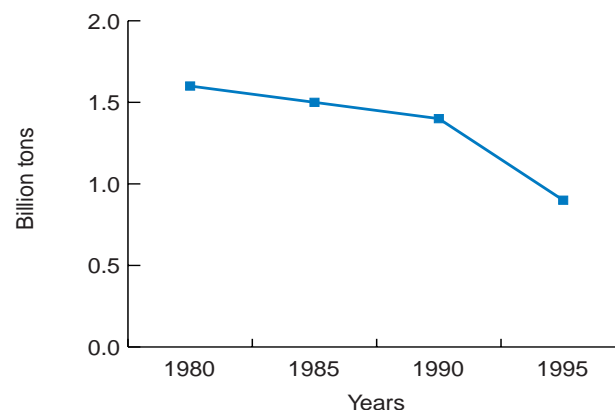
Source: Center for the Study of Carbon Dioxide and Global Change, 1999

Indiana carbon dioxide emissions



Source: IDEM Office of Air Management, 1998

National sulfur dioxide emissions



Source: U.S. Environmental Protection Agency, Acid Rain Program Emissions Scorecard, 1995